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(54) BIODEGRADABLE FLEXIBLE FILM

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a lactate-based resin flexible film which has excellent heat resistance, packaging aptitude and processing aptitude with a biodegradability which a lactate-based resin originally has.
SOLUTION: It comprises a composition containing a lactate-based resin composition which comprises a lactate resin of 50-95 mass% and a plasticizer of 5-50 mass%. In the film, a crystallizing heat-quantity ΔHc of a lactate-based resin component is 0-10 J/g and a melting calorie ΔHm is 10-50 J/g.

CLAIMS

[Claim(s)]
[Claim 1]A biodegradable flexible film whose amount of heat of fusion **Hm a lactic-acid-system-resin constituent which consists of the lactic acid system resin 50 - 95 mass %, and five to plasticizer 50 mass % is used as the main ingredients, crystallization-heat-quantity **Hc of a lactic-acid-system-resin ingredient in a film is 0 - 10 J/g, and is 10 - 50 J/g.
[Claim 2]Frequency of 10 Hz, the biodegradable flexible film according to claim 1 in which 20 - 700MPa and loss tangent tandelta have storage-modulus E' measured by a dynamic-viscoelasticity-measurement method under conditions with a temperature of 20 ** in the range of 0.2-0.8.
[Claim 3]The biodegradable flexible film according to claim 1 or 2, wherein a tensile stress ratio (sigmaMD/TD) of a TD direction (rectangular directions of MD directions) to MD directions (the direction of taking over) of a film is in the range of 0.4-2.5 in a range to 200% of a pace of expansion.

[Claim 4]The biodegradable flexible film according to any one of claims 1 to 3 whose lactic acid system resin is a blended body of a homopolymer which makes a structural unit L-lactic acid or D-lactic acid, and a copolymer which makes a structural unit both L-lactic acid and D-lactic acid.

NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to a biodegradable flexible film.
[0002]
[Description of the Prior Art]Generally, the plastic was stable over the long period of time in natural environment, and moreover, since relative bulk density was small, the problem of having promoted the ephemeralization of a waste reclaimed ground or spoiling a natural scene and the living environment of wildness animals and plants was pointed out.
[0003]On the other hand, from the rise of an environmental problem, when a plastic is rejected in natural environment, it decomposes and disappears temporally and not having an adverse effect on natural environment eventually is called for in recent years.
[0004]For this reason, the biodegradable resin material attracts attention today. This biodegradable resin is inside of soil, and underwater, collapse and decomposition advance gradually by hydrolysis or biodegradation, and becoming a harmless decomposition product by operation of a microorganism eventually is known.
[0005]As biodegradable resin which is beginning to be put in practical use, polylactic acid, aliphatic polyester, the denaturation PVA, a cellulose ester compound, starch modification objects, these blended bodies, etc. are raised.
[0006]These biodegradable plastics have the respectively peculiar feature, and use deployment according to these is achieved.
For example, the biodegradable plastic material of polyolefine-like inside elasticity, the polystyrene-like hard biodegradable plastic material, etc. are known widely.

[0007]
[Problem(s) to be Solved by the Invention]However, the elasticity-VCM/PVC[very soft and transparent]-like biodegradable plastic material is not known.

[0008]This elasticity VCM/PVC (it carries out abbreviated to "elasticity PVC" hereafter.) is widely used for the film for foodstuffs stretch packaging, an industrial use protective film, a dicing film, the film for adhesive bandages, etc., and development of biodegradable alternate material was desired from a viewpoint corresponding to environment.
[0009]It is transparent, add a plasticizer to lactic acid system resin which is hard material, and the trial which it is going to elasticity-ize, It is indicated by JP,4-335060,A, JP,7-118513,A, JP,2000-136300,A, JP,2000-198908,A, JP,2000-248164,A, etc. Although the constituent and Plastic solid which become these gazettes from lactic acid system resin and a plasticizer are indicated, It had technical problems, such as having neither the stress-strain diagram characteristic like an elasticity PVC film with insufficient heat resistance which a temporal change of the bleeding of a plasticizer, embrittlement, etc. produces, nor the relaxation characteristic, and did not fully have the practical use characteristic as elasticity PVC film alternate material.
[0010]Then, this invention aims to let lactic acid system resin provide the lactic-acid-system-resin flexible film which possesses temporal stability, heat resistance, packaging aptitude, etc. simultaneously in addition to the biodegradability which it originally has.
[0011]
[Means for Solving the Problem]This invention used as the main ingredients a lactic-acid-system-resin constituent which consists of the lactic acid system resin 50 - 95 mass %, and five to plasticizer 50 mass %, and crystallization-heat-quantity **Hc of a lactic-acid-system-resin ingredient in a film is 0-10J/g, and when amount of heat of fusion **Hm considered it as 10 - 50 J/g, it solved the above-mentioned technical problem.
[0012]
[Embodiment of the Invention]Below, this invention is explained in detail. The biodegradable flexible film concerning this invention is a film which uses as the main ingredients the lactic-acid-system-resin constituent which consists of lactic acid system resin and a plasticizer. The homopolymer whose structural unit of the above-mentioned lactic acid system resin is L-lactic acid or D-lactic acid, That is, poly (L-lactic acid) or poly (D-lactic acid), and a structural unit may say the copolymer which are both L-lactic acid and D-lactic acid, i.e., poly, (DL-lactic acid), and these mixtures, and may be a copolymer with alpha-hydroxycarboxylic acid, or diol/dicarboxylic acid further.
[0013]As a method of polymerizing lactic acid system resin, which publicly known methods, such as a condensation polymerization method and a ring-opening-polymerization method, are employable. For example, by a condensation polymerization method, the lactic acid system resin which carried out dehydration polycondensation of L-lactic acid, D-lactic acid, or these mixtures directly, and had arbitrary presentations can be obtained.
[0014]By a ring-opening-polymerization method, a polylactic acid system polymer can be obtained using the catalyst chosen in the lactide which is a cyclic dimer of lactic acid while using the modifier etc. if needed. Lactide includes L-lactide which is a dimer of L-lactic acid, D-lactide which is the dimers of D-lactic acid, and DL-lactide which consists of L-lactic acid and D-lactic acid further, and lactic acid system resin with arbitrary presentations and crystallinity can be obtained by mixing these if needed and polymerizing.
[0015]Non-aliphatic series diol, such as non-aliphatic dicarboxylic acid, such as

terephthalic acid, and an ethyleneoxide addition of bisphenol A, etc. may be used as a small-quantity copolymerization ingredient if needed for raising heat resistance etc.
[0016]A small amount of chain elongation agents, for example, a diisocyanate compound, an epoxy compound, an acid anhydride, etc. can be used for the purpose of molecular weight increase further again.
[0017]As other above-mentioned hydroxy-carboxylic acid units by which copolymerization is carried out to the above-mentioned lactic acid system resin, The optical isomer of lactic acid (to L-lactic acid, it is L-lactic acid to D-lactic acid and D-lactic acid), Glycolic acid, 3-hydroxybutyric acid, 4-hydroxybutyrate, 2-hydroxy-n-butanoic acid, Lactone, such as 2 organic-functions aliphatic series hydroxy-carboxylic acid, such as 2-hydroxy 3,3-dimethylbutanoic acid, 2-hydroxy 3-methylbutyric acid, 2-methyllactic acid, and 2-hydroxycaproic acid, a caprolactone, a butyrolactone, and a valerolactone, is raised.
[0018]As the above-mentioned aliphatic series diol by which copolymerization is carried out to the above-mentioned lactic acid system resin, ethylene glycol, 1,4-butanediol, 1, and 4-cyclohexane dimethanol etc. are raised. As the above-mentioned aliphatic dicarboxylic acid, succinic acid, adipic acid, suberic acid, sebacic acid, dodecanedioic acid, etc. are raised.
[0019]As a range with preferred weight average molecular weight of the above-mentioned lactic acid system resin, it is 100,000 to 250,000 preferably, 50,000 to 400,000, and when less than this range, practical use physical properties are hardly revealed, but in exceeding, melt viscosity is too high and inferior to molding workability.
[0020]Crystallization-heat-quantity **Hc of the lactic-acid-system-resin ingredient in the biodegradable flexible film concerning this invention has good 0 - 10 J/g, and its 0 - 5 J/g is preferred. If it exceeds the range which requires **Hc, in a room temperature, the degree of crystallinity of a film increases temporally, it will embrittle or the bleeding of a plasticizer will happen easily with crystallization.
[0021]As for amount of heat of fusion **Hm of the lactic-acid-system-resin ingredient in the above-mentioned biodegradable flexible film, g is good in 10-50J /, and its 20 - 50 J/g is preferred. Heat resistance becomes scarce, such as melting in a microwave oven, when **Hm was less than 10 J/g and it is considered as a food-grade stretch film. Although the amount of perfect crystal heat of fusion of a polylactic acid homopolymer is 93J/g, it is difficult to exceed 50 J/g industrially, and is accompanied by the problem of a manufacturing cost.
[0022]The above-mentioned crystallization-heat-quantity **Hc and amount of heat of fusion **Hm, and one big factor that adjusts especially the latter are the copolymerization ratios of L-lactic acid and D-lactic acid in lactic acid system resin. In order to attain these ranges independently, the above-mentioned lactic acid system resin, The copolymerization ratio of L object and D object to L object:D object =100:0-90:10, or 0:100-10:90 preferably, It is preferred 100:0-93:7 or 0:100-7:93, and to make it still more desirable, without 100:0-95:5, or 0:100-5:95. Out of this range, it becomes difficult to adjust **Hm to the range of desired.
[0023]It is also possible to blend two or more lactic acid system resin which has a copolymerization ratio of a different L object and D object. In this case, what is necessary is just to make it the average value of the copolymerization ratio of L object of two or more lactic acid system resin and D object go into a mentioned range. Especially when

using the blended body of the homopolymer which makes a structural unit L-lactic acid or D-lactic acid, and the copolymer which makes a structural unit both L-lactic acid and D-lactic acid maintains the difficulty of carrying out of bleeding, and the balance of a heat-resistant manifestation, it is preferred.

[0024]In the above-mentioned lactic acid system resin, the glass transition temperature Tg can also blend 0 ** or less of aliphatic polyester resin and aliphatic series aromatic polyester resin by 20 or less weight sections in order to give shock resistance and cold resistance.

[0025]As the above-mentioned aliphatic polyester resin, aliphatic polyester resin except lactic acid system resin, for example, the aliphatic polyester produced by condensing aliphatic series diol and aliphatic dicarboxylic acid, the aliphatic polyester which carried out ring opening polymerization of the annular lactone, constructional system aliphatic polyester, etc. are raised.

[0026]The aliphatic polyester produced by condensing above-mentioned aliphatic series diol and aliphatic dicarboxylic acid, Out of ethylene glycol, 1,4-butanediol, 1,4-cyclohexane dimethanol, etc. which are aliphatic series diol, the succinic acid, the adipic acid, suberic acid and sebacic acid which are aliphatic dicarboxylic acid, dodecanedioic acid, etc., one or more kinds are chosen, a condensation polymerization is carried out, and it is obtained, respectively. It can jump up with an isocyanate compound etc. if needed, and desired polymer can be obtained. In order to raise heat resistance and mechanical strength, copolymerization of the aromatic monomer ingredients, such as terephthalic acid not more than 50mol%, can also be carried out as a dicarboxylic acid component.

[0027]As aliphatic polyester which carried out ring opening polymerization of the above-mentioned annular lactone, it is raised typically, and epsilon-caprolactone which is an annular monomer, delta-valerolactone, one or more kinds of beta-methyl-delta-valerolactones, etc. are chosen from these, and polymerize.

[0028]As the above-mentioned constructional system aliphatic polyester, a copolymer with the copolymer of a cyclic anhydride and oxirane, for example, the copolymer of a succinic anhydride and ethyleneoxide, propylene oxide, etc., etc. are raised.

[0029]As for the above-mentioned plasticizer, although it is used in order to make lactic acid system resin elasticity-ize, and what fulfills other conditions of this invention is chosen suitably, it is preferred that at least one kind is chosen from the compound shown in following the (1) - (9) from a viewpoint of compatibility or biodegradability.

[0030](1) $H_5C_3(OH)_{3-n}(OOCCH_3)_n$ (however, $0< n<=3$)

This is mono- of glycerin, di-, or triacetate, and although these mixtures may be sufficient, the direction of n near 3 is preferred.

(2) Glycerin alkylate (an alkyl group may have the residue of the carbon numbers 2-20 and a hydroxyl group)

For example, glycerin tripropionate, a glycerin TORIBUCHI rate, etc. are raised.

[0031](3) Ethylene glycol alkylate (an alkyl group may have the residue of the carbon numbers 1-20 and a hydroxyl group)

For example, ethylene glycol diacetate etc. are raised.

(4) An ethylene repeating unit is 5. The following polyethylene-glycol alkylates (an alkyl group may have the residue of the carbon numbers 1-20 and a hydroxyl group)

For example, diethylene-glycol mono- acetate, diethylene-glycol diacetate, etc. are raised.

[0032](5) Aliphatic-monocarboxylic-acid alkyl ester (alkyl groups are the carbon numbers 1-20)
For example, butyl stearate etc. are raised.
(6) Aliphatic-dicarboxylic-acid alkyl ester (an alkyl group may have the residue of the carbon numbers 1-20 and a carboxyl group)
For example, a di(2-ethylhexyl) horse mackerel peat, di(2-ethylhexyl) Azelate etc. are raised.
[0033](7) Aliphatic series tricarboxylic acid alkyl ester (an alkyl group may have the residue of the carbon numbers 1-20 and a carboxyl group)
For example, citrate trimethyl ester etc. are raised.
(8) With a weight average molecular weight of 20,000 or less low-molecular-weight aliphatic polyester.
For example, succinic acid, ethylene glycol / propylene glycol condensation product (Dainippon Ink trade name: poly sizer), etc. are raised.
[0034](9) Natural oil fat and those derivatives, for example, soybean oil, epoxidized soybean oil, castor oil, tung oil, rape oil, etc. are raised.
[0035]It is a weight ratio, as for the mixing ratio of lactic acid system resin in the above-mentioned lactic-acid-system-resin constituent, and a plasticizer, lactic-acid-system-resin:plasticizer =50 - 95:5 - 50 are good, and 60-90:10-40 are preferred. The characteristic suitable as a flexible film may not be given out of the range which requires the quantity of a plasticizer. In particular when too little, the elasticity-izing itself does not progress, but when excessive, the problem that viscosity falls too much at the time of melting extrusion may arise.
[0036]As for the above-mentioned biodegradable flexible film, it is preferred that storage-modulus E' of the film measured by the dynamic-viscoelasticity-measurement method under with the frequency of 10 Hz and a temperature of 20 ** conditions is in the range of 20 - 700MPa, and it is more preferred that it is in the range of 50 - 500MPa.
[0037]it may be soft in E' being less than 20 MPa, and stress may be too small to modification, as an object for foodstuffs stretch packaging, packaging operation nature may worsen, and the tension of the film of a pack article may not be enough, and a display effect may be inferior. On the other hand, if E' exceeds 700MPa, it becomes a hard and easily unextended film and may be easy to produce modification of a tray.
[0038]As for the above-mentioned biodegradable flexible film, it is preferred that loss tangent tandelta is in the range of 0.2-0.8, and it is more preferred that it is in the range of 0.25-0.6. Since the restoration action [as opposed to / that tandelta is less than 0.2 / the elongation of the above-mentioned biodegradable flexible film] is momentary, Until it inserts a biodegradable flexible film into the bottom of a tray, while it is small, a biodegradable flexible film reverts, and it is easy to generate wrinkles, without the ability to stretch a biodegradable flexible film well. Since sufficient weld by heat does not do easily in the case of stretch packaging, the heat-sealing state of a pars basilaris ossis occipitalis also becomes easy to produce peeling of a bottom seal after a package and during transportation thru/or exhibition gradually.
[0039]On the other hand, if tandelta exceeds 0.8, a package result will show plasticity modification of a good thing, the tension over the external force of a pack article is too weak, by the pile under transportation thru/or exhibition, etc., the film on the upper surface of a tray will curtain easily, and commodity value will fall easily. Since it is easy

to be extended perpendicularly in an automatic package, which problem with a poor zipper is easy to produce. Especially the suitable ranges of tandelta are 0.30-0.60. Even if it is uses other than foodstuffs stretch packaging, the range of same E' and tandelta is desirable from a viewpoint of workability or machinery fitness.

[0040]In order to make E' and tandelta of the above-mentioned biodegradable flexible film into the above-mentioned range, especially the thing for which the amount of plasticizers is made into a mentioned range is important, but in the presentation of lactic acid system resin, the kind of plasticizer, the amount of plasticizers, and the combination of a molding working condition, it is adjusted suitably.

[0041]In the lactic-acid-system-resin constituent which constitutes the above-mentioned biodegradable flexible film. Additive agents, such as a thermostabilizer, an anti-oxidant, UV absorbent, light stabilizer, paints, colorant, lubricant, a nucleating additive, and hydrolysis inhibitor, can be prescribed if needed in the range which does not spoil this effect of the invention other than the above-mentioned lactic-acid-system-resin constituent.

[0042]The biodegradable flexible film concerning this invention can be manufactured by the arbitrary methods of the film molding method by the usual melting extrusion. Using the direction biaxial extrusion machine, a kneader, a Henschel mixer, etc. beforehand as a method of obtaining a constituent, a pre compound may be carried out, the dry blend of each raw material may be carried out, and it may be directly fed into a film extrusion machine. Liquefied ingredients, such as a plasticizer, can also be poured in from a vent-port apart from a solid ingredient using a pump etc. As an example of a film molding method, the cast method, the extending method, a tubular film process, the CHUBURA method, etc. are employable.

[0043]As for applying fixed time heat to a film, in order to adjust amount of heat of fusion **Hm of the biodegradable flexible film obtained to the range of 10 - 50 J/g, it is preferred to cool slowly or to reheat after film shaping, in addition to adjustment of LD ratio of the above-mentioned raw material, etc. They are 1 to 200 seconds at 30-130 **, and as for desirable heating conditions, 2 to 30 seconds is more preferred at 40-100 **, and they are still more preferred at 50-80 **. [of 3 to 20 seconds] The biodegradable flexible film which will be obtained if less than this range does not reach the desired amount of heat of fusion, but if temperature exceeds, a biodegradable flexible film will stick to the roll within a process, and it will become easy to generate a process trouble. If it exceeds the range which requires time, a process becomes long and is not preferred in manufacturing cost. In addition to direct heating, you may heat by energy waves, such as high frequency and an ultrasonic wave.

[0044]The tensile stress ratio (sigmaMD/TD) of a TD direction (rectangular directions of MD directions) to the MD directions (the direction of taking over) of the biodegradable flexible film obtained by the above-mentioned method is good to use the range of 0.4-2.5 in the range to 200% of a pace of expansion, and it is preferred to use the range of 0.5-2.0. Out of this range, in foodstuffs stretch packaging, wrinkles enter on the outskirts of a corner of a tray easily, and it is hard to secure the workability at the time of lamination in an industrial use protective film.

[0045]In order to make a tensile stress ratio (sigmaMD/TD) into a mentioned range, in a tubular film process, taking over speed and a blow ratio are important, and it is preferred to make a blow ratio into the range of 1.2-5.0. In the cast method, it is preferred to set an

extrusion pulling-down rate to 1.0-10.0. In the extending method, it is preferred to set vertical draw magnification to 1.5-5.0, and to set lateral orientation magnification to 2.0-6.0.

[0046]The biodegradable flexible film obtained by this invention can be used as flexible films, such as an industrial use protective film and an adhesive bandage, especially a film for foodstuffs stretch packaging.

[0047]

[Example]Although an example is shown below, this invention does not receive restriction at all by these. On conditions as shown below, the measured value shown in an example measured and was computed.

[0048]1) Crystallization-heat-quantity **Hc and an amount of heat of fusion **Hm film were started circularly [5 mmphi], and the quantity of heat of only a lactic-acid-system-resin ingredient was computed using PerkinElmer DSC-7 from the thermogram obtained by performing temperature-up measurement based on JIS-K7121.

[0049]2) It measured about the transverse direction of the film with the dynamic viscosity measuring method of the statement using Iwamoto Factory viscoelasticity spectrometer VES-F3 at the vibrational frequency of 10 Hz, the temperature of 20 **, and 0 ** by the E' and tandeltaJISK-7198 A method.

[0050]3) tensile stress ratio (sigmaMD/TD)

doing a tensile test by a part for speed-of-testing/of 200 mm about MD (flow direction) and TD (cross direction) of a film according to JIS- K1702 -- the stress of MD -- the stress of TD -- **** -- it computed by things.

[0051]4) A stretch film with a stretch packaging fitness stretch packaging fitness width of 350 mm is used, The form polystyrene tray (200 mm in length, 130 mm in width, and 30 mm in height) was packed with the automatic packer (ISHIDA-Wmin MK-II by the Ishida ****), and the standard shown in Table 1 estimated.

[0052]

[Table 1]

	評価方法	評価基準		
		○	△	×
張り	パック品上面を手で押さえたときの反発性や積み重ねた時のたわみを評価	張りがよく、反発力も強い。	張りがやや弱いが、実用レベルにある。	張りが明らかに弱い。
トレー変形	フィルムの張りに対しトレーがどれだけ変形しているかを評価	トレーの変形が１ｍｍ以下。	トレーの変形が１～２ｍｍであるが、実用レベルにある。	トレーの変形が２ｍｍ以上。
しわ	パック品上面のシワの有無、程度を評価	しわがなく、平面に張れている。	しわが少しあるが、実用レベルにある。	明らかにしわがある。
たるみ	パック品の中に５０ｇのおもりを入れ、５段重ねにし、２４時間静置後、最下段のパック品をとり、上面のたるみを評価	平面性を復元し、平面に張れている。	少したるんでいるが、実用レベルにある。	明らかにたるんでいる。

[0053]5) Heat-resistant form polystyrene tray (200 mm in length, and 130 mm in width.) Two tempura (about 160 mm in length) of a shrimp was put into 30 mm in height, and the packaging machine of 4 performed film packaging, and it put into the 500W microwave oven, and heated for 3 minutes, the tear condition of the film by heat was observed, and the following standards estimated.

O = a hole did not open.
** = the level which does not have a use top problem although a little holes opened.
x = the big hole opened.
[0054]6) The bleeding film of the plasticizer was settled for one month into a 30 ** thermostat, and relative evaluation was made on the amount of bleeding as follows with the touch.
O = it is not different from before an examination.
** = bleeding is accepted for a while.
x = bleeding is carried out in large quantities clearly.
[0055](Example 1) L object : Cargill Dow lactic-acid-system-resin NatureWorks4031D which is D object =99:1, The raw material compound was performed with the extrusion temperature of 200 **, having mixed stearic acid aluminum 0.1phr as lubricant, having presented the Mitsubishi Heavy Industries, LTD. make 45-mmphi said direction extrusion machine, and pouring in dibutyl horse mackerel peat (product made from Daihachi Chemicals) 38 mass part as a plasticizer from a vent-port.
[0056]The round die and the 60 mmphi single screw extruder by Mitsubishi Heavy Industries, LTD. which put the inflation film production line side by side were presented with the raw material which carried out the compound, extrusion was performed with the extrusion temperature of 200 **, and the 15-micrometer-thick cylindrical film was obtained by the blow up ratio (BUR) 3.0.
[0057]After applying the cutter to one place of a cylindrical film and opening a film planate, the multiplex-heat-treatment roll was made to contact and heat treatment was performed for [70 **x] 20 seconds. The evaluation result of the obtained film is shown in Table 2.
[0058](2/of examples comparative examples 1-5) Various film samples were extracted by the method same only by changing raw resin and various conditions as Example 1. The evaluation result of the obtained film is shown in Table 2.
[0059]The raw material and conditions which are not indicated in a table and which were used are as follows.
- Example 2 : use Cargill Dow NatureWorks4060D as the second lactic acid system resin.
- Comparative example 1 : it did not heat-treat.
- Comparative example 2 : use Cargill Dow NatureWorks4060D as lactic acid system resin.
- Comparative example 4 : use a triacetin (product made from Daihachi Chemicals) as a plasticizer.
- Comparative example 5 : use dioctyl phthalate (product made from Daihachi Chemicals) as a plasticizer.
[0060](3/of examples comparative example 6) The compound raw material extracted by the same method as Example 1 as a plasticizer using the triacetin (product made from Daihachi Chemicals), The Mitsubishi Heavy Industries, LTD. make serial biaxial oriented film tenter possessing a 90 mmphi single screw extruder was presented, it fabricated at the extrusion temperature of 200 **, and the extension temperature of 60 **, and a 15-micrometer film was obtained.
[0061]At this time, draw magnification was set up as follows.
- Example 3: MDxTD= 3x3 times and, comparative example 6: The evaluation result of the film obtained MDxTD= 1x5 times is shown in Table 2.

[0062]
[Table 2]

	実施例			比較例					
	1	2	3	1	2	3	4	5	6
乳酸系樹脂①のL：DL比	99:1	100:0	95:5	99:1	85:15	99:1	99:1	95:5	95:5
乳酸系樹脂②のL：DL比	—	86:15	—	—	—	—	—	—	—
①／②の混合比	—	70:30	—	—	—	—	—	—	—
可塑剤	ｼﾞﾌﾞﾁﾙｱｼﾞﾍﾟｰﾄ	ｼﾞﾌﾞﾁﾙｱｼﾞﾍﾟｰﾄ	ﾄﾘｱｾﾁﾝ	ｼﾞﾌﾞﾁﾙｱｼﾞﾍﾟｰﾄ	ｼﾞﾌﾞﾁﾙｱｼﾞﾍﾟｰﾄ	ｼﾞﾌﾞﾁﾙｱｼﾞﾍﾟｰﾄ	ﾄﾘｱｾﾁﾝ	ｼﾞｵｸﾁﾙﾌﾀﾚｰﾄ	ｼﾞｵｸﾁﾙﾌﾀﾚｰﾄ
可塑剤添加量 （質量部）	40	40	35	40	40	22	30	50	40
ΔHc （J/g）	0	1	12	20	0	0	0	0	10
ΔHm （J/g）	45	30	32	45	0	45	45	32	32
E’ （MPa）	100	85	320	80	65	910	480	18	400
tanδ	0.5	0.52	0.76	0.45	0.4	0.15	1.2	0.22	0.78
σ （MD/TD）	0.6	0.6	1.0	0.6	0.6	0.6	0.6	0.6	3.0
フィルム包装適正 張り	○	○	○	○	○	○	○	×	○
フィルム包装適正 トレー変形	○	○	△	○	○	×	△	○	△
フィルム包装適正 しわ	○	○	△	○	○	×	△	○	×
フィルム包装適正 たるみ	○	○	△	○	○	○	×	○	△
耐熱性	○	○	○	△	×	○	○	○	○
可塑剤のブリード	○	○	△	×	○	○	○	△	○
総合評価	○	◎	○～△	×	×	×	×	×	×
備　考		トレー変形やブリード面で実施例1より優れる。							

[0063]
[Effect of the Invention]According to this invention, the lactic-acid-system-resin flexible film which possesses simultaneously the heat resistance and packaging aptitude in which lactic acid system resin was excellent in addition to the biodegradability which it originally has, and processing suitability can be provided.

[Translation done.]